FLORISTIC COMPOSITION OF THE SAN JOSÉ DEL CABO OASIS, BAJA CALIFORNIA SUR, MÉXICO

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ABSTRACT

The wetlands in the Baja California peninsula can be thought of as biological islands because they are surrounded by an arid environment. Also, because of the small area and regular exposure of the wetlands to catastrophic floods, endemic species are rare. The oasis of San José del Cabo is close to the ocean, but the water has relatively low levels of salinity. This oasis is the remnant of a small river that existed at the beginning of this century but which dried up from anthropogenic causes and increasing aridity in the region. Since this oasis is in one of the major tourist developments in Mexico, the aquifer will be affected in the future because of unregulated use to satisfy needs of tourism and of the increasing population. The objective of our study is to document the floristic composition of the wetland to serve as future reference. Our checklist contains 109 taxa of vascular plants. Of these, 78 (71%) are herbs (annuals and perennials). Only 4 (3%) of the taxa are uniformly distributed in the 30 hectares of this study (16 hectares of which are water).

KEYWORDS: Oases, Baja California, Flora

RESUMEN

Los humedales de Baja California Sur pueden considerarse islas biológicas debido a que con sus relativamente elevados niveles de humedad se encuentran rodeados de territorios áridos; sin embargo, debido a la baja superficie que presentan y la exposición a inundaciones catastróficas, su composición florística es pobre en endemismos. El oasis de San José del Cabo se encuentra próximo al mar, pero la intrusión de agua salobre es baja. Este oasis es el último vestigio de un río existente todavía a principios de este siglo, que se secó debido a causas antropógenas e incremento de la aridez en esta región. Debido a que éste se encuentra dentro de uno zona de los grandes desarrollo turístico de México, el acuífero que lo abastece será afectado en los años próximos debido a la sobreextracción de agua para satisfacer las demandas del turismo y de la población en expansión. El objetivo del presente estudio es documentar la composición florística actual en este oasis de modo que sirva como referencia para el futuro. El listado anexo comprende 109 taxa de plantas vasculares, de éstas el 78 (71%) son herbáceas (anuales y perennes), pero sólo el 4 (3%) están uniformemente distribuidos en las 30 hectáreas consideradas en este estudio (16 de ellas son de agua).

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INTRODUCTION

Baja California Sur is the Mexican state with the least available freshwater. This is because of low rainfall and also the small number of permanent waterways (spring, seeps, pools, rivers, lakes) and reservoirs, some of which are locally called "pozas" or "oases" (Escurra et al. 1988; Grismer and McGuire 1993). Additional causes of the aridity are the predominance of coarse-textured soils that favor water percolation, the high levels of evaporation from the soil, the lack of high mountains, and the narrowness of the peninsula, which provides little surface area for hydrological basins. Some authors, such as Axelrod (1979) and Murphy (1983), suggested an evolving climate on the peninsula. This change has allowed the climate to vary from a mesic subtropical environment through most of the Tertiary to the current xerophytic environment. If true, the oases could be interpreted as relict and disjunct mesic habitats.

The biological relevance of these small areas is in their biotic composition, which can be found only in places with constantly available water, in mesic habitats outside the xeric peninsula, or on mountain tops where temperatures are cooler and precipitation is greater than in the surrounding desert. The social and economical importance of these areas is obvious.

Currently, there are dozens of oases in the peninsula, some of them isolated and others grouped. Some of the best known are San Ignacio (27°25'N, 112°52'W, elev. 150 m), Comondú (26°02'N, 111°49'W, elev. 400 m), La Purísima (26°10'N,112°07'W, elev. 150 m), Mulegé (26°53'N, 112°02'W, elev. 2 m), Las Pocitas system (around 24°30'N, 111°00'W, elev. 100 to 150 m), and San José del Cabo (23°03'N, 109°41'W, elev. 1 m). Some of these are close to the ocean; others are fed by water from the nearest mountains or by springs. There are no geo-hydrological studies from which to determine their dynamics.

Other wetlands, oases, or estuaries have vanished in the last few decades, some because of water extraction in the hydrological basins to satisfy increasing demands of the local populations. It is possible that the disappearance of wetlands has been exacerbated by the combination of these demands with the natural process of increased aridity in the region (Axelrod 1979; Spaulding and Graumlich 1986). Such wetlands include Todos Santos (23°27'N, 110°18'W, elev. 5 m), Santiago (23°28'N, 109°42'W, elev. 350 m), and Santa Agueda (27°18'N, 112°21'W, elev. 230 m). Other areas may have been wetlands centuries ago, e.g., El Carrizal (23°51'N, 110°10'W, elev. 150 m) and La Ribera (23°34'N, 109°35'W, elev. 10 m).

Lugo et al. (1988) pointed out, in a general classification of these areas, that because of the catastrophic floods and ecological limitations of such environment they have a low species richness, or low ß diversity, com-

pared to adjacent habitats. Because of the catastrophic floods, the wetlands also have a relatively young structure. Moreover, they are influenced by certain environmental factors that seem to regulate the structure and other processes in the plant groups. Among these factors are the periodicity of floods and droughts, the kinetic energy of the water, the predominance of the water flux, and the nutrient concentration in the soil. The fundamental niche for each species in the wetlands could be affected to a large degree by water dynamics and nutrient factors.

Cowardin et al. (1979) proposed a hierarchical system of classification for wetlands that was based on water regimen, water chemistry, and soil types. Each oasis can be considered a *palustrine* system if it is less than 2 m deep, or a *lacustrine* system if deeper, if we assume that the water flows slowly and has a small surface area. Using this same classification, these must be designated as "forested wetlands" if palms dominate physiognomically, or as "emergent wetlands" if cattails (*Typha*), reeds, and forbs are dominant.

In addition to the desire to preserve these communities for both ecological and socioeconomic reasons, the study of their plant composition is basic to the proposal of legislation for their use and management.

Vegetation around the San José del Cabo oasis, according the Mexican official chart of vegetation (INEGI 1981), corresponds to the sarcocaulescent scrub. Shreve and Wiggins (1964) and Wiggins (1980) recognized this area as a disjointed segment of the Sonoran Desert inside the Cape Region. The oasis is physiognomically dominated by the sky-duster palm, *Washingtonia robusta*, an endemic species occupying riverside and stream banks in the southern half of the peninsula. In the past, this palm probably was widespread inland where moisture in the soil was relatively high. Today, these lands are occupied by abandoned or presently cultivated fields and secondary vegetation. In natural conditions, the ground cover could change dramatically according to the incidence of catastrophic floods, which seem to occur at least once each decade.

Our objective was to compile a floristic list of the higher plants growing in the vicinity of the San José del Cabo oasis. This list can serve as a baseline reference for additional studies seeking to record quality changes in the vegetation over time. The work was a part of a proposal for legislation to designate this community as a protected area. Such a designation was made by state legislation in 1993.

METHODS

During May, July, and September 1993, three trips were made to the oasis to collect plants. The oasis was crossed by foot along its river's edge.

The river consists of a strip of saturated soil of variable width. We estimated a surface of about seven hectares for this area. About 16 hectares of water were traversed by boat to collect aquatic plants.

Specimens collected are housed in the herbarium of the Centro de Investigaciones Biológicas (HCIB). References used for identification were Gould and Moran (1981), Lot et al. (1986), Shreve and Wiggins (1964), and Wiggins (1980). A checklist was devised beginning with our first field trip. It was considered complete after the third trip when no additional species were found. The life form of each species was noted based on the references cited above. Relative abundance was determined by using the density and distribution pattern shown in Table 1. Finally, because adjacent land has been used for intensive agriculture, a proportion of the current flora came from weeds associated primarily with the crops. Using information from the references and voucher specimens collected elsewhere in the state and peninsula, we classified each taxon of the flora as either indigenous or non-indigenous.

DESCRIPTION OF THE OASIS

The San José del Cabo oasis is at 23°04'N and 109°41'W at the southern tip of the Mexican state of Baja California Sur. According to García (1973), the Koeppen climate formula is BW(h')w(e). The climate is very dry and very hot, with a mean annual total precipitation (25 years) of 260 mm. Figure 1 shows the geographic location of the oasis.

The oasis is separated from the ocean (Gulf of California) by a 40 m sandbar. The water level in the oasis is partially regulated by hydrostatic forces of the tides, but intrusion of salt water is small.

The borders of this oasis (and others of the Sonoran Desert) seem to be contracting with the gradual increasing aridity during recent millennia (Van Devender 1990). In addition to depletion of the aquifer, occasional floods from the uplands are sometimes so violent that the oasis is almost swept clean. After such floods, the flora recovers but the conformation of the oasis is altered to some extent. Presently, water covers almost 16 hectares.

TABLE 1. Abundance critera used for the vascular plants of the San José del Cabo oasis. Value **xx** has greater dominance (evaluated as frequency, coberture and height) than value **x**. See appendix.

Population Density	Distribution: Regular	Distribution: Clumped
High	xxxx	xxx
Low	xx	x

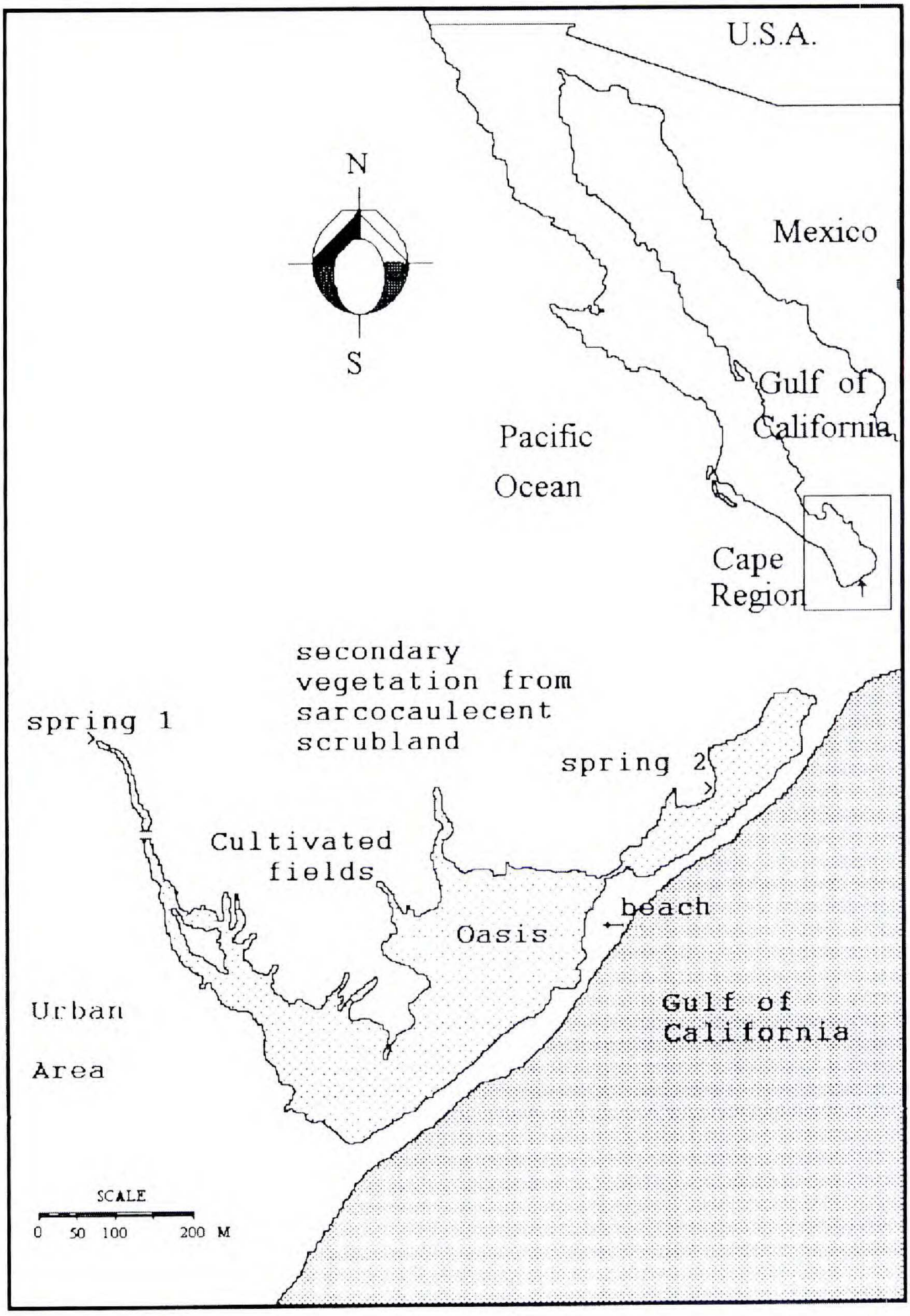

FIG. 1. Geographical location of the San José del Cabo oasis at the southern end of the Baja California peninsula, Mexico (upper). Delimitation of the oasis in relation to its suburbs (lower).

Nelson (1921) noted, in 1905–1906, the existence of the "San José River," a stream that arose from a spring about 1 km upland and flowed into a freshwater "lagoon" (the current oasis), which supported a flourishing agricultural area of around 300 hectares. The human population, then, was estimated to be 1600. Rice and sugarcane were some of the more prominent crops because of their high water requirements.

Currently, this oasis is in one of the more important tourist developments in Mexico, Los Cabos. There are around 6000 hotel rooms, each with a potential consumption of 400 to 500 liters day^{-1} when occupied. There is also consumption for domestic purpose by almost 35,000 inhabitants. Reuse of water is highly recommended but not yet developed.

At first, water to satisfy this demand came entirely from wells, all of them in the watershed of the oasis. In 1992 an aqueduct, which gathers the water pumped by several wells, some in agricultural valleys upland, was completed to satisfy requirements of both tourists and inhabitants. It has a flow of 2000 to 3000 liters $minute^{-1}$. This expenditure is higher than recovery by the aquifer and will inevitably drain it.

CHECKLIST

We did not recognize vegetation types based on physiognomic criteria. Palms, cattails, and reeds have an irregular distribution along the river's edge.

In the attached checklist, each entry is followed by its corresponding life form, abundance, and whether it is native or non-indigenous. Table 2 summarizes the life forms of the 109 taxa of vascular plants of this oasis. Most of them, 78 (71%), are annual or perennial herbs; 13 (12%) are shrubs or trees, and 18 (16%) belong to other life forms.

Table 3 gives the relative abundance of the species of the checklist. Only four (3.6%) taxa have an abundance pattern of high density and regular distribution, marked in the catalog as XXXX; these are *Washingtonia robusta, Typha domingensis, Bacopa monnieri*, and *Phragmites australis*. Most of the species, 80 (73.4%), show a pattern of low density and regular distribution, marked XX.

There is a notable difference between this oasis and the northern ones in the peninsula. This one has a low number of date palms, *Phoenix dactylifera*, a species introduced into the oases of the peninsula as a food resource by Spanish missionaries in the 16th and 17th centuries. This species survives now as feral groves or with minimal management.

Our work establishes the distribution of several taxa not known before for this latitude on the peninsula, i.e., *Echinodorus berteroi, Kosteletzkia depressa Phyla incisa, Ruellia inundata, Rumex pulcher,* and *Xanthium strumarium*, all known in wetlands from 4° to the north or in those tropical areas.

Table 2. Life forms of the vascular plants in the oasis of San José del Cabo, Baja California Sur.

Life forms	No. of taxa	Percentage
Trees (Tr)	4	3.66
Shrubs (Sh)	9	8.26
Perennial herbs (Ph)	41	37.64
Annuals (An)	37	33.93
Hydrophytes + Aquatics (Aq)	7	6.43
Vines (Vi)	10	9.17
Parasites (Pa)	1	0.91
Total	109	100.00

Table 3. Classification of the taxa of vascular plants according to their relative abundance in the oases of San Jose del Cabo, Baja California Sur. See Table 1 and appendix.

Abundance	code	number of taxa	percentage
1	(xxxx)	4	3.66
2	(xxx)	8	7.34
3	(xx)	80	73.40
4	(x)	17	15.60
		Σ 109	Σ 100.00

Only 49 (44.9%) of the species in this oasis are natives (in the appendix marked N). The remaining 60 (55.1%) are non-indigenous species indicative of early successional stages or clearly introduced weeds (marked IW) coming from cultivated fields or disturbed areas, such as *Amaranthus fimbriatus, Argemone ochroleuca, Cynodon dactylon, Dactyloctenium aegypticum, Datura inoxia, Perityle californica,* and *Sida xantii*.

This implies that the wetland has been changed from its original structure. The main sources of disturbances are the agricultural use of the adjacent land, the cutting down of the sky duster palm for support and roofing of rustic "palapas," and the severe floods regularly affecting the oasis. All these provide niches for species typical of early succesional stages. An additional clue to support this statement is the number of species tied to high levels of humidity (pointed out here as "aquatics" [Aq], of which there are only seven [6.43%]).

Because of the proximity of the ocean to this wetland, one might expect the presence of any of the five mangroves native to the Baja California peninsula, but there are none. For Baja California Hastings et al. (1972) and Wiggins (1980) identified *Avicennia germinans*, the uncommon *Conocarpus erecta, Laguncularia racemosa*, the more inland *Maytenus phyllanthoides*, and *Rhizophora mangle,* some of which occur even in higher latitudes in the peninsula up to Bahía de los Angeles at 29°00'N.

A possible explanation for the absence of mangroves in this wetland is given by Alvarez-López (1988) and Lugo et al.(1978). Mangroves grow in warm waters of low kinetic energy with highly predictable cycles. In tropical latitudes, they grow in water with low salinity. In subtropical latitudes, they are linked to highly saline water, a condition not prevailing here.

From the types of freshwater vegetation in Mexico, Rzedowski (1978) cited the "popal," "tular," and "carrizal" as those occurring in hot and temperature climates. These last two are poorly represented in this oasis because of the dominance of, *Phragmites australis, Scirpus americanus, Typha domingensis*, and other monocotyledons. Floating and submersed species are not dominant here. *Potamogeton* is a widespread aquatic form in the peninsula, but it is absent from the oasis.

CONCLUSIONS

Grismer and McGuire (1993) studied 31 oases in the central Baja California peninsula. Because each has its own physical and biological features, each requires its own characterization. Ezcurra et al. (1988) studied the flora and phytogeography of 17 oases in the hyper-arid zone of the Sonoran Desert, almost all in natural condition. They reported only 26 species of vascular plants, none endemic. Most of these (31%) are taxa distributed in northwestern Mexico and southwestern United States. The hemicryptophytes (perennial herbs with their perennating buds at the soil surface) were the dominant life forms (58%). Felger (1980) studied life forms in several oases of the Sonoran Desert. He found 145 taxa, 54% of them annuals. The life form spectrum found in our checklist is consistent with such results, but dominance of these probably is a sign of disturbance, since 28 of our annuals (73.7%) are considered as introduced weeds.

Rzedowski (1978) indicated, in Mexico, that agricultural and industrial activities and water demand for domestic use have affected aquatic communities more than any other plant community type. The geographic position of San José del Cabo oasis, i.e., within the tropics, and the permanent nature of the water would seem enough to allow a richer flora than that found. Undoubtedly, human disturbance, e.g., clearing of channels, dredging, fumigation against mosquitoes, fires, sewage flow, and cutting down palms have modified the original plant composition drastically, contributing to modification of both composition and structure.

Additional evidence of disturbance in this place is the analysis of the associated fauna. Nelson (1921) quoted for this oasis the endemic rice mouse (*Oryzomys couesi* var. *peninsularis*), which Alvarez-Castañeda (1994) considered to be now extinct.

This oasis is a community which has largely lost its original composi-

tion. Its existence is threatened unless the extraction of water is regulated in its watershed and the water is recycled after treatment for nonpotable use. Today, the oasis is an informal park where tourists go for a stroll. Our report represents one of the last opportunities for studying these special communities of the Baja California and the Sonoran Desert.

ACKNOWLEDGMENTS

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APPENDIX

Annotated checklist of the vegetation of the San José del Cabo oasis, Baja California Sur, México.

Family/Species	L.F.	Abundance	Residence
MONOCOTYLEDONES			
Alismataceae			
Echinodorus berteroi (Spreng.) Fassett MDL 1502	Aq	x	N
Arecaceae			
Phoenix dactilifera L. No Voucher	Tr	xx	IW
Washingtonia robusta Wendell No Voucher	Tr	xxxx	N
Commelinaceae			
Commelina dianthifolia Del. JLLL 6094	Ph	xx	N
Cyperaceae			
Cyperus dioicus I.M. Johnston JLLL 6116	Ph	xx	N
Cyperus ferax L.C. Rich. JLLL 6117	Ph	xx	N
Cyperus pringlei Britt. MDL 1486	Ph	xx	N
Cyperus sp. JLLL 6075	Ph	xx	N
Eleocharis parishii Britt. RDC 1729	Ph	xx	N
Scirpus americanus Pers. MDL 1489,RDC 1699	Aq	xx	N
Scirpus californicus (C. A. Mey) Steud. RDC 1723	Ph	xx	N

Lemnaceae			
Lemna aequinoctialis Welw. JLLL 6049	Aq	xx	N
Naiadaceae			
Naias marina L. JLLL 6114	Aq	xxx	N
Typhaceae			
Typha domingensis Pers. RDC 239	Aq	xxxx	N
Poaceae			
Arundo donax L. MDL 998, 999	Sh	xx	IW
Cenchrus ciliaris L. RDC 1706	Ph	xx	IW
Chloris virgata Swartz MDL 1492	An	xx	IW
Cynodon dactylon (L.) Pers. No voucher	Ph	xx	IW
Dactyloctenium aegypticum (L.) Beauv. RDC 1708	An	x	IW
Digitaria ciliaris (Retz.) Koel JLLL 6090	An	xx	N
Distichlis spicata (L.) Greene JLLL 6084	Ph	xx	N
Muhlenbergia microsperma (DC.) Kunth MDL 1479, RDC 1711	An	xx	N
Panicum purpurascens Raddi RDC 1718	Ph	xx	N
Paspalum vaginatum Sw. JLLL 6115	An	xx	IW
Phragmites australis Trin. No voucher	Sh	xxxx	N
Potamogetonaceae			
Ruppia maritima L. MDL 517	Aq	xx	N
DICOTYLEDONES			
Acanthaceae			
Elytraria imbricata (Vahl.) Pers. JLLL 6092	Ph	xx	IW
Ruellia inundata Kuntze JLLL 6091	Ph	xx	N
Amaranthaceae			
Amaranthus fimbriatus (Torr.) Benth. MDL 1478	An	x	IW
Amaranthus spinosus L. RDC 453	An	xx	IW
Froelichia interrupta (L.) Moq. RDC 1707	Ph	xxx	IW

Apiaceae			
Apium leptophyllum (Pers.) F. Muell. MDL 1477	Ph	xx	IW
Eryngium nasturtiifolium . Juss. ex Delar JLLL 6121	An	xx	IW
Asclepiadaceae			
Cryptostegia grandifolia (Roxb.) R. Br. RDC 1706	Vi	xx	N
Cynanchun palmeri (S. Wats.) S.F. Blake JLLL 6119	Vi	xx	N
Boraginaceae			
Coldenia cuspidata I. M. Johnston MDL 1472	Ph	x	IW
Heliotropium curassavicum L. RDC 455	Ph	xx	IW
Heliotropium macrostachyum (DC.) Hemsl. JLLL 6123	Ph	xx	IW
Chenopodiaceae			
Atriplex barclayana (Benth.) D. Dietr. subsp. *barclayana* MDL 1462	Sh	xx	IW
Chenopodium ambrosioides L. RDC 1712	An	xx	IW
Chenopodium murale L. MDL 1469	An	xx	IW
Capparidaceae			
Cleome lutea Hook. subsp. *jonesii* (Tidestr.) Macbr. JLLL 6122	An	xx	N
Compositae			
Ambrosia ambrosioides (Cav.) Payne JLLL 6120	xx An	N	
Ambrosia confertiflora DC. MDL 1497	Ph	xx	IW
Aster exilis Ell. JLLL 6105	An	x	IW
Baccharis glutinosa Pers. RDC 1715	An	xx	N
Bidens aurea (Ait.) Sherff. MDL 1495	An	xx	IW
Conyza bonariensis (L.) Cronquist. MDL 1488	An	x	IW
Eclipta prostrata (L.) L. JLLL 6102	Ph	xxx	IW
Encelia californica Nutt. MDL 1503	Ph	xx	IW

Gnaphalium bicolor Bioletti MDL 1507	An	x	N
Malacothrix xantii A. Gray MDL 995	An	x	N
Perytile californica Benth. RDC 1722	An	xx	IW
Perytile aurea Rose MDL 1509	An	xx	IW
Senecio sp. MDL 1510	Ph	xx	IW
Sonchus oleraceus L. JLLL 6070	An	x	IW
Viguiera tomentosa A.Gray JLLL 6078	Sh	xx	N
Xanthium strumarium L. MDL 1476	An	xx	IW
Cucurbitaceae			
Cucumis dipsaceus Ehrenb. ex Spach. RDC 1719	Vi	xx	IW
Luffa operculata (L.) Cogn. var. *intermedia* Cogn. ex Rose MDL 1488	Vi	x	IW
Momordica charantia L. RDC 1714, JLLL 6124	Vi	xx	N
Convolvulaceae			
Cuscuta campestris Yunck. MDL 1485	Pa	x	N
Ipomoea sp. JLLL 6110	Vi	x	IW
Merremia quinquefolia (L.) Hallier JLLL 6109	Vi	xx	N
Euphorbiaceae			
Croton californicus Muell.-Arg. ex DC. RDC 1700	Sh	xx	IW
Euphorbia leucophylla Benth. JLLL 6103	Ph	xx	IW
Ricinus communis L. No voucher	Sh	x	IW
Gentianaceae			
Eustoma exaltatum (L.) Griseb. RDC 1703	Ph	xx	N
Labiatae			
Salvia similis Brandegee RDC 1709	Sh	xx	N
Leguminosae			
Cannavalia villosa Benth. MDL 1487	Vi	xxx	N
Crotalaria incana L. RDC 1713	Ph	xx	IW
Neptunia plena (L.) Benth. MDL 1471	Ph	xx	N

Phaseolus atropurpureus Sessé & Moc. MDL 1494	An	xx	N
Rhynchosia minima (L.) DC. JLLL 6106	Vi	xx	N
Loganiaceae			
Buddleja crotonoides A. Gray JLLL 6076	Sh	xx	IW
Lytrhaceae			
Ammania coccinea Rottb. JLLL 6077	Ph	xx	IW
Malvaceae			
Abutilon incanum (Link) Sweet MDL 1423	Ph	xx	IW
Abutilon sp. MDL 1425	An	x	IW
Gossypium barbadense L. MDL 1505	Sh	xx	IW
Herissantia crispa (L.) Brizicky RDC 1698	Ph	xx	N
Horsfordia alata (S. Wats.) A. Gray JLLL 6079	Ph	xx	IW
Kosteletzkya depressa (L.) O. Blanch. Fryxell & Gates JLLL 6096	Ph	xx	N
Malvastrum coromandelianum (L.) Garcke MDL 1463	Ph	xx	IW
Sida rhombifolia L. MDL 1434	Ph	xx	IW
Sida xantii A. Gray MDL 1506	Ph	xx	IW
Sphaeralcea ambigua A. Gray var. *ambigua* A. Gray JLLL 6111	An	xx	IW
Sphaeralcea ambigua A. Gray var. *rosaceae* (Munz & I.M. Johnston) Kearney JLLL 6080	An	xx	IW
Nyctaginaceae			
Boerhavia coccinea Mill. JLLL 6071	Ph	x	IW
Polygonaceae			
Polygonum hydropiperoides Michx. MDL 1440	Aq	xx	N
Rumex pulcher L. JLLL 6095	Ph	xxx	N
Onagraceae			
Gaura parviflora Douglas ex Hook. JLLL 6118	xx	Ph	N

Ludwigia octovalvis (Jacq.) Raven RDC 1697	Ph	xxx	N
Ludwigia peploides (Kunth) Raven subsp. *peploides* JLLL 6060	An	xxx	N
Papaveraceae			
Argemone ochroleuca Sweet JLLL 6053	An	xx	IW
Plumbaginaceae			
Plumbago scandens L. MDL 1415	Ph	xx	N
Portulacacceae			
Portulacca pilosa L. MDL 1429	An	xx	IW
Portulacca oleracea L. MDL 1430	An	xx	IW
Primulaceae			
Anagallis arvensis L. JLLL 6027	Ph	x	IW
Rubiaceae			
Houstonia arenaria Rose RDC 1670	An	x	IW
Salicaceae			
Populus fremontii S. Wats RDC 1728	Tr	xx	N
Salix lasiolepis Benth. MDL 1437	Tr	xx	N
Scrophulariaceae			
Bacopa monnieri (L.) Wettst. JLLL 6124	Ph	xxxx	N
Solanaceae			
Datura inoxia Mill. MDL 1498	An	xx	IW
Nicotiana glauca R. Graham No voucher	Sh	xx	IW
Nicotiana trigonophylla Dunal JLLL 6066	An	xx	IW
Physalis crassifolia Benth. MDL 1501	An	xx	IW
Solanum nigrum A. Gray MDL 1427	An	xx	IW
Verbenaceae			
Phyla incisa Small JLLL 6101	An	xx	IW
Vitaceae			
Cissus trifoliata (L.) L. JLLL 6125	Vi	xxx	N

L. F. = Life Form		Abundance	Residence
Tr.	Tree	(See Tables 1 & 3)	IW = Introduced/Weed
Sh.	Shrub		N = Native
Ph.	Perennial herbs		
An.	Annuals		
Aq.	Aquatics/Hydrophytes		
Vi.	Vines (annuals + woody)		
Pa.	Parasites		

Collectors' names: (All of the specimens are housed at the HCIB herbarium)

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